Chapter 7

Emerging therapeutic roles of exosomes in HIV-1 infection

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1 Introduction

Human Immunodeficiency Virus Type 1 (HIV-1), together with HIV-2, are retroviruses responsible for causing HIV infection which leads to acquired immunodeficiency syndrome (AIDS) [1]. The virus is normally transmitted through sexual intercourse but can also be transmitted through sharing of needles and from mother to child via breast-feeding [1]. There are many ways in which HIV-1 can propagate once they are in the host, and exosomes which are 30–100nm vesicles have been shown to play a vital role in the pathogenesis of HIV-1. Membrane-bound exosomes are derived from endosomes and are ubiquitously found in many cell types and from various biological fluids including plasma [2], saliva [3], urine [4], ascitic fluid [5], semen [6], breast milk [7], cerebrospinal fluid (CSF) [8], bronchoalveolar lavage (BAL) [9], and amniotic fluid [10]. These nanometer-sized vesicles can be secreted from immune cells including but not limited to macrophages, B-cells, T-cells, dendritic cells (DCs) and tumour cells [11, 12]. Exosomes secretion is being employed for cell-cell communication, and information carried in exosomes can regulate gene expression, cell proliferation and invasion, and immune regulation in various cell types [4, 11, 12]. These findings were discovered more than 30 years ago and became a major topic of research since after it was found that exosomes from B-cells could transport major histocompatibility complex class II (MHC-II) to T-cells [13]. In 2007, human exosomes from mast cells were found to contain messenger RNA (mRNA) and microRNA (miRNA) that have exerted biological effects in the recipient cells [14, 15]. In this article, we will review the implication of exosomes on the pathogenesis of HIV-1, and how a deeper understanding on exosomes could contribute towards better clinical judgements.

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